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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/785,234

02/24/2004

Thomas W. Oakes

OAK-01

1047

7590  
William J. Kolegraff  
3119 Tumberry Way  
Jamul, CA 91935

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EXAMINER

WILKINS III, HARRY D

ART UNIT

PAPER NUMBER

1723

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/785,234	<b>Applicant(s)</b> OAKES, THOMAS W.	
	<b>Examiner</b> Harry D. Wilkins, III	<b>Art Unit</b> 1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,3-20,23-27 and 29-35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-20,23-27 and 29-35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Interference***

1. Interference No. 105,692 has been terminated by a decision adverse to applicant. *Ex parte* prosecution has resumed.

### ***Continued Examination Under 37 CFR 1.114***

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 26 October 2010 has been entered.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1, 3-20, 23-27 and 29-35 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. The term "highly restrictive" in claims 1 and 23 is a relative term which renders the claim indefinite. The term "highly restrictive" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is unclear from the specification as filed to what degree the membrane

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must restrict passage of the electrolyte solution. Thus, the claim is interpreted in light of the context of the specification to have the equivalent resistance to passage of the electrolyte solution as typical proton exchange membranes.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1, 4-12, 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over the "lost count" of Interference No. 105,692 in view of Yamazaki (US 4,528,252).

As discussed in MPEP 2308.03, Applicant is barred on the merits from seeking a claim that would have been anticipated or rendered obvious by the subject matter of the lost count. *In re Deckler* 977 F.2d 1449, 24 USPQ2d 1448. The lost count of Interference No. 105,692 was as follows:

*A device for generating hydrogen gas, comprising:*

*an elongate vessel having a proximate end and a distal end, the elongated vessel holding an electrolyte solution;*

*a thin and flexible membrane extending from the proximate end to the distal end in the vessel, the membrane arranged to form a chamber;*

*an elongated cathode strip in the chamber and positioned within the electrolyte solution, the elongated cathode strip substantially extending the length of the chamber;*

*an elongated anode strip in the vessel but not in the chamber and positioned within the electrolyte solution, the elongated anode strip substantially extending the length of the chamber;*

*a hydrogen gas collection area in the chamber*

*a hydrogen gas exhaustion arrangement coupled to the gas collection area;*

*an electric source connected to the cathode and the anode;*

*wherein the electric source includes a photovoltaic cell in the vessel; and*

*wherein the vessel has a transparent cover, the transparent cover in constructed to concentrate light rays onto the photovoltaic cell.*

Thus, the difference between the “lost count” and the presently claimed invention is that the membrane “extend[s] completely through the electrolyte solution to form a separate chamber”, “[is] constructed to be highly restrictive to the flow of the electrolyte solution” and “is highly restrictive to the passage of any electrolyte solution from the chamber”.

However, as taught by Yamazaki in use of membranes that extend completely through an electrolyte solution and which do not permit electrolyte solution to pass from one side to the other were known in the art of electrolysis of water to produce hydrogen gas. The membranes acted to permit independent collection of hydrogen gas and

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oxygen gas and preventing mixing of the two gases. The membrane of Yamazaki, like the membrane of the present invention, was permeable to ions, but otherwise impermeable to the electrolyte solution. Impermeable is interpreted to mean "highly restrictive".

Therefore, it would have been obvious to one of ordinary skill in the art to have modified the apparatus corresponding to the "lost count" by ensuring that the membrane extended completely through the electrolyte solution and did not permit electrolyte solution to pass from the chamber, as is taught by Yamazaki, for the purpose of preventing mixing of the produced hydrogen and oxygen gases.

Regarding claims 4-6, the "lost count" teaches the concept of providing a transparent cover such that the cover and electrolyte acted to concentrate sunlight onto the photovoltaic cell to enhance the energy efficiency of the device.

Regarding claims 7-9, the device of the "lost count" would have been capable of operating with any electrolyte. As per MPEP 2114 and 2115, apparatus claims are limited by the claimed structure, not in what material is placed within the structure. As such, the limitations of claims 7-9 have not been given further patentable weight.

Regarding claim 10, the membrane of Yamazaki was arranged to form an oxygen chamber, with the anode arranged within the oxygen chamber.

Regarding claim 11, although both the "lost count" and Yamazaki teach only a single anode chamber and a single cathode chamber, duplication of parts has been considered to be an obvious variation absent a showing of unexpected results. See MPEP 2144.04.VI.B.

Regarding claim 12, the device of Yamazaki included an oxygen gas collection area in the oxygen chamber and an oxygen gas exhaustion arrangement coupled to the oxygen gas collection area. It would have been obvious to one of ordinary skill in the art to have added such to the device of the "lost count" to permit independent collection of the oxygen gas.

Regarding claims 34 and 35, one of ordinary skill in the art was aware that the minimum theoretical voltage required to split water was 1.23 volts, but the actual voltage had to be higher to overcome over-voltage effects. Therefore, it would have been obvious to one of ordinary skill in the art to have optimized the voltage applied to the anode and cathode in order to be above the threshold voltage to initiate water electrolysis and to overcome any over-voltage effects that would prevent the reaction from occurring.

8. Claims 3 and 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the "lost count" of Interference No. 105,692 in view of Yamazaki (US 4,528,252) as applied above to claim 1 and further in view of Dederick (US 5,512,787).

The lost count teaches using only the solar panel as the means for generating the electric current for running the electrolyzer.

However, it was well known that solar panels only generated electricity during the day when the sky was sufficiently devoid of clouds.

Dederick teaches (see Figure 1A and abstract) the concept of using other renewable energy sources, such as solar panels, wind generators and wave action generators for powering an electrolyzer to reduce the need for fossil fuels to generate

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the required electricity. Further, Dederick shows (see Figure 1A) switching gear for using any of a plurality of power sources in combination.

Therefore, it would have been obvious to one of ordinary skill in the art to have used an external renewable energy source, such as an additional solar cell, a hydroelectric plant or a wind turbine to provide the electric power necessary to operate the electrolyzer because Dederick teaches that using such renewable resources reduced reliance on fossil fuels.

9. Claims 13, 14, 23, 26, 27, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over the "lost count" of Interference No. 105,692 in view of Yamazaki (US 4,528,252) as applied above to claim 1 and further in view of Dempsey et al (US 3,870,616).

Yamazaki fails to disclose the exact nature of the ion exchange membrane.

However, one of ordinary skill in the art, in the absence of such detail, would have looked to similar water electrolyzers for the purpose of determining a proper membrane to use.

Dempsey et al shows (see paragraph spanning cols. 2 and 3) the conventional use of Nafion<sup>®</sup> membranes to separate an anode chamber from a cathode chamber in a water electrolyzers to allow separate collection of the produced hydrogen and oxygen gases.

Therefore, it would have been obvious to one of ordinary skill in the art to have made the device of the lost count with an ion exchange membrane made from Nafion<sup>®</sup> (a conventional polymeric membrane made from sulfonated tetrafluoroethylene



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copolymer, that conducted protons and not electrons and was substantially impermeable to gases) because the Nafion<sup>®</sup> was conventionally known within the art of water electrolyzers to have the appropriate properties to separate anode chambers from cathode chambers.

Regarding claim 23, the electric source included a solar cell in the vessel and positioned so that light can pass through the transparent cover, the electrolyte solution and onto the solar cell. Further the device would have included power conduits for connecting the solar cell to the anode and cathode so that electricity generated by the solar cell drove an electrolysis process.

Regarding claims 26 and 27, Dempsey et al suggest making the anode and cathode from a platinized screen containing a catalyst of platinum and iridium. Therefore, one of ordinary skill in the art would have been led to have utilized the composite platinum and iridium composition disclosed by Dempsey et al for the purpose of providing adequate catalytic activity to perform the water electrolysis reaction.

Regarding claim 29, it would have been within the expected skill of a routineer in the art to have chosen an optimal membrane thickness to balance the ease of conducting protons (conductivity increases with decreasing thickness) with the ability to prevent mixing of the oxygen and hydrogen gases (ability to keep the gases separate increases with increasing thickness).

10. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over the "lost count" of Interference No. 105,692 in view of Yamazaki (US 4,528,252) as applied above to claim 1 and further in view of Russell (US 4,052,228).

The teachings of the lost count and Yamazaki are described above.

Russell teaches (see col. 1, lines 48-59) the concept of adding a cooling device in thermal communication with the electrolyte to ensure that efficient operation occurs.

Therefore, it would have been obvious to one of ordinary skill in the art to have added a cooling device in thermal communication with the electrolyte and coupled to the electric source.

11. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over the "lost count" of Interference No. 105,692 in view of Yamazaki (US 4,528,252) as applied above to claim 23 and further in view of Dederick (US 5,512,787).

The lost count only teaches using the solar panel as the means for generating the electric current for running the electrolyzer.

However, it was well known that solar panels only generated electricity during the day when the sky was sufficiently devoid of clouds.

Dederick teaches (see Figure 1A and abstract) the concept of using other renewable energy sources, such as solar panels, wind generators and wave action generators for powering an electrolyzer to reduce the need for fossil fuels to generate the required electricity. Further, Dederick shows (see Figure 1A) switching gear for using any of a plurality of power sources in combination.

Therefore, it would have been obvious to one of ordinary skill in the art to have used an external renewable energy source, such as an additional solar cell, a hydroelectric plant or a wind turbine to provide the electric power necessary to operate

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the electrolyzer because Dederick teaches that using such renewable resources reduced reliance on fossil fuels.

12. Claims 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over the "lost count" of Interference No. 105,692 in view of Yamazaki (US 4,528,252) as applied above to claim 1 and further in view of Ohkawa (US 4,352,722).

The teachings of the lost count and Yamazaki are described above.

Ohkawa teaches (see col. 3, lines 56-61) using metal for both anode and cathode in an electrolytic cell powered by a photovoltaic cell. Specifically, the anode may be made from nickel. These metals have good conductive properties and do not corrode.

Therefore, it would have been obvious to one of ordinary skill in the art to have made the anode and cathode from metal, with the anode made of nickel, as suggested by Ohkawa for the purpose of ensuring adequate conductive properties, corrosion resistance and cost.

### ***Response to Arguments***

13. Applicant's arguments filed 26 October 2010 have been fully considered but they are not persuasive. Applicant has argued that the membrane of Yamazaki was not "highly restrictive" to the flow of the electrolyte solution.

In response, this is not found persuasive. Given the lack of specifics regarding the restriction of flow in the specification, the claim language is being interpreted to mean "as restrictive to flow" as is the typical proton exchange membrane utilized in the

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present invention. The membrane taught by Yamazaki is a typical proton exchange membrane, and thus, would be expected to have such flow restrictivity.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 9:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Harry D Wilkins, III/  
Primary Examiner, Art Unit 1795

hdw